

REMARKS

In response to the above-identified Final Office Action, Applicants amend the application and seek reconsideration thereof. In this response, Applicants amend claims 4, 9, 14 and 16. Applicants do not cancel or add any new claims. Accordingly, Claims 4-6, 9-11, 14-16 and 19-22 are pending.

I. Claims Rejected Under 35 U.S.C. §103

A. Obvious over Lee

The Patent Office rejects Claims 4-5, 9-10, 14-15 and 22 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,641,922 issued to Lee, et al. ("Lee"). Applicants amend claims 4, 9 and 14.

To render a claim obvious, the relied upon references must teach or suggest each element of the claim such that the invention as a whole would have been obvious at the time the invention was made to one skilled in the art. Among other elements, amended independent claim 4 defines an interconnection comprising an aluminum-copper-titanium alloy layer containing about 0.5 atomic percent copper, wherein 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $Ti(Al,Cu)_3$. Support for this amendment can be found in the Specification on page 13, lines 20-23. Applicants respectfully submit Lee in view of the prior art fails to teach or suggest at least these elements.

In making the rejection, the Patent Office characterizes Lee as showing an interconnect containing an aluminum-copper-titanium alloy layer with 0.15% titanium, 0.5% copper and the remainder aluminum. See Paper No. 11122003, page 2 (citing Figure 1 and Table I of Lee). Lee discloses "a multi-layer interconnect structure that uses layers of titanium, titanium nitride and aluminum-copper alloy to improve electromigration reliability." Lee, Col. 1, lines 10-13. Table I of Lee shows an interconnect structure having an alloy having aluminum, 0.5 percent copper and 0.15 percent titanium. See Lee Col. 4, lines 52-55 and Table I, test sample #1. Lee does not include any discussion regarding the alloy of sample #1 in Table I. Rather, Table I merely recites a

test sample alloy having aluminum, 0.5 percent copper and 0.15 percent titanium. Therefore, Lee does not teach or suggest 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $\text{Ti}(\text{Al,Cu})_3$ since Lee does not include any discussion regarding the alloy of sample #1.

The failure of Lee to teach or suggest each of the elements of claim 4 is fatal to the obviousness rejection. Therefore, claim 4 is not obvious over Lee in view of the prior art. Accordingly, Applicants respectfully request withdrawal of the rejection of independent claim 4.

Claims 5 and 22 depend from claim 4 and include each of the elements of claim 4. Therefore, claims 5 and 22 are not obvious over Lee in view the prior art at least for the same reasons as claim 4. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 5 and 22.

Regarding the rejection of independent claim 9, Applicants respectfully submit claim 9 defines an interconnection comprising an aluminum-copper-titanium alloy layer containing about 0.5 atomic percent copper, wherein 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $\text{Ti}(\text{Al,Cu})_3$ similar to claim 4 above. Therefore, claim 9 is not obvious over Lee in view of the prior art at least for the reasons discussed above with respect to claim 4. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 9.

Claim 10 depends from claim 9 and includes each of the elements of claim 9. Therefore claim 10 is not obvious over Lee in view of the prior art at least for the same reasons as claim 9. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 10.

Regarding the rejection of independent claim 14, Applicants respectfully submit claim 14 defines an integrated circuit comprising an interconnection having an aluminum-copper-titanium alloy layer containing about 0.5 atomic percent copper, wherein 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $\text{Ti}(\text{Al,Cu})_3$ similar to claims 4 and 9 above. Therefore, claim 14 is not obvious over Lee in view of the prior art at least for the reasons discussed above with respect to claims 4 and 9. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 14.

Claim 15 depends from claim 14 and includes each of the elements of claim 14. Therefore claim 15 is not obvious over Lee in view of the prior art at least for the same reasons as claim 14. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 15.

B. Obvious over Inoue in view of Lee

The Patent Office rejects claims 6, 11, 16 and 19-21 under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 5,635,763 issued to Inoue et al. ("Inoue") in view of Lee. Applicants amend claims 4, 9 and 16.

To render a claim obvious, the relied upon references must teach or suggest each element of the claim such that the invention as a whole would have been obvious at the time the invention was made to one skilled in the art. Among other elements, claim 6, which depends from claim 4, defines an interconnection comprising an aluminum-copper-titanium alloy layer containing about 0.5 atomic percent copper, wherein 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $\text{Ti}(\text{Al,Cu})_3$. Applicants respectfully submit the combination of Inoue and Lee fails to teach or suggest at least these elements.

The Patent Office characterizes Inoue as showing a multi-layer interconnection structure having "a second titanium nitride layer 9 overlying a second titanium layer 21, an aluminum layer 10 overlying the second titanium nitride layer 9, a first titanium layer 23 overlying the aluminum alloy layer 10, and a first titanium-nitride layer 11 overlying the first titanium layer 23." Paper No. 11122003, page 3. The Patent Office does not rely on Inoue to teach or suggest an interconnection comprising an aluminum-copper-titanium alloy layer. In fact, the Patent Office admits Inoue fails to teach or suggest such an aluminum-copper-titanium alloy layer.

In addition, in reviewing Inoue, Applicants are unable to discern any section of Inoue that teach or suggest such an aluminum-copper-titanium alloy layer. Therefore, Applicants respectfully submits Inoue fails to teach or suggest at least an interconnection comprising an aluminum-copper-titanium alloy layer containing about 0.5 atomic percent copper, wherein 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $\text{Ti}(\text{Al,Cu})_3$ since Inoue

fails to teach or suggest an interconnection comprising an aluminum-copper-titanium alloy layer. The Patent Office relies on Lee to cure the defects of Inoue.

As discussed above, claim 6 depends from claim 4 and includes each of the elements of claim 4. Therefore, the discussion above regarding Lee failing to teach or suggest at least an interconnection comprising an aluminum-copper-titanium alloy layer containing about 0.5 atomic percent copper, wherein 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $\text{Ti}(\text{Al,Cu})_3$ is equally applicable to claim 6. Thus, Lee fails to cure the defects of Inoue.

The failure of Inoue and Lee to teach or suggest each of the elements of claim 6 is fatal to the obviousness rejection. Therefore, claim 6 is not obvious over Inoue in view of Lee. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 6.

Regarding the rejection of claim 11, claim 11 depends from claim 9 and contains each of the elements of claim 9. Therefore, Applicants respectfully submit claim 11 defines an interconnection comprising an aluminum-copper-titanium alloy layer containing about 0.5 atomic percent copper, wherein 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $\text{Ti}(\text{Al,Cu})_3$ similar to claim 4 discussed above. Therefore, Applicants respectfully submit claim 11 is not obvious over Inoue in view of Lee at least for the reasons discussed above with respect to claim 6. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 11.

Regarding the rejection of independent claim 16, Applicants respectfully submit claim 16 defines a multilayered interconnection structure, the interconnection comprising an aluminum-copper-titanium alloy layer containing about 0.5 atomic percent copper, wherein 0.2 percent of the 0.5 percent copper is maintained within the aluminum-copper-titanium alloy as $\text{Ti}(\text{Al,Cu})_3$ similar to claim 4 discussed above. Therefore, Applicants respectfully submit claim 16 is not obvious over Inoue in view of Lee at least for the reasons discussed above with respect to claims 6 and 11. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 16.

Claims 19-21 each depend from claim 16 and include each of the elements of claim 16. Therefore, claims 19-21 are not obvious over Inoue in view of Lee at least for the same reasons as claim 16. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 19-21.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending (1) are in proper form, (2) are neither obvious nor anticipated by the relied upon art of record, and (3) are in condition for allowance. A Notice of Allowance is earnestly solicited at the earliest possible date. If the Examiner believes that a telephone conference would be useful in moving the application forward to allowance, the Examiner is encouraged to contact the undersigned at (310) 207-3800.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly, extension of time fees.

Respectfully submitted,

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Dated: 1/20, 2004

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CERTIFICATE OF MAILING:

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on January 20, 2004.

Nadya Gordon 1/20/04
Nadya Gordon Date